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PRESERVICE STUDENT TEACHERS' ATTITUDES TOWARDS CHEMISTRY TEACHING: THE CASE OF EGERTON UNIVERSITY, KENYA

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Abstract

The purpose of this study was to determine the attitudes held by preservice chemistry student teachers. A survey was conducted on Egerton University students in the 2002/2003 academic year. The sample included all the Bachelor of Education (Science) preservice chemistry students. These students had just covered the Chemistry Subject Methods course and were about to start their teaching practice programme. The sample consisted of 71 male and 34 female student teachers, making a total of 105 respondents. A modified Chemistry Teachers' Attitudes Questionnaire (CTAQ) for measuring chemistry teachers' attitudes towards teaching was developed and used for data collection. Data were analysed using descriptive statistics, t-test and Analysis of Variance (ANOVA). The results show that preservice chemistry student teachers have high positive attitudes towards teaching. Student teachers' gender and subject combination have no influence on their attitudes towards chemistry teaching. These findings suggest that the current teacher training approach at Egerton University should be maintained and enriched.

Introduction

For a chemistry teacher to undertake the teaching task properly, he or she should possess adequate chemistry subject matter, effective communication skills and favourable attitudes towards chemistry teaching (Elton & Manwaring, 1982). Azeb (1982) said that some scholars argue that when a person has mastered the subject matter he can teach it. No doubt, the first pre-requisite of good teaching is content mastery. When a teacher has content deficiency, no amount of training in pedagogy would make up for the deficiency. However, when one has mastered the subject matter, then effective communication and proper attitudes can help improve the teaching and thereby improve students' learning.

Research has shown that "teaching can be taught" and that almost everyone with sufficient academic knowledge can become, if not a brilliant teacher, at least a better

one (Bazler & Simons, 1990). It is with this background in mind that Egerton University's chemistry education programme has been designed. The programme contains education and chemistry courses aimed at producing chemistry teachers who possess adequate content, communication skills and favourable attitudes (Egerton University, 1999). Such teachers would be able to assist secondary school students achieve the objectives of the chemistry course. These objectives are as follows:-

- i) Handle apparatus, make accurate observations and draw simple conclusions during experimental work.
- ii) Select and use appropriate apparatus for experimental investigations.
- iii) Recall safety procedures and follow experimental practices.
- iv) Write chemical symbols of elements and formulae of compounds and equations of simple reactions.
- v) Identify patterns of chemical behaviour of substances.
- vi) Use ideas, concepts and skills acquired in learning chemistry to solve problems in everyday life (Kenya Institute of Education (KIE), 2002)

For a teacher to be able to cover the content required for the achievement of the above objectives within the stipulated time, he/she must possess the right teaching attitudes. Such attitudes are acquired during training at university. However, the extent to which Egerton University's student teachers are acquiring these attitudes in the course of training is not known. Therefore, this study seeks to establish the students' attitudes towards the teaching of chemistry.

Statement of the Problem

Chemistry is a key science subject in the curriculum of educational institutions because it assists in the study of other science subjects such as Biology and Physics. In addition, it is involved in important processes such as the production of food, drugs and plastics. Therefore, it should be taught by motivated teachers who have the right attitudes towards it. However, the attitude of teachers who are being prepared to join the chemistry teaching profession is not clearly known. Also, the influence of the teacher's gender and subject combination on attitudes towards chemistry teaching needs to be determined.

Purpose and Objectives of the Study

The study was designed to determine the attitudes held by preservice chemistry student teachers at Egerton University. Its specific objectives were to:-

1. establish the preservice student teachers' attitudes towards chemistry teaching.
2. determine whether gender influences the student teacher's attitudes towards chemistry teaching.
3. establish whether there is a relationship between a students' subject combination and his or her attitude towards chemistry teaching.

Research Hypotheses

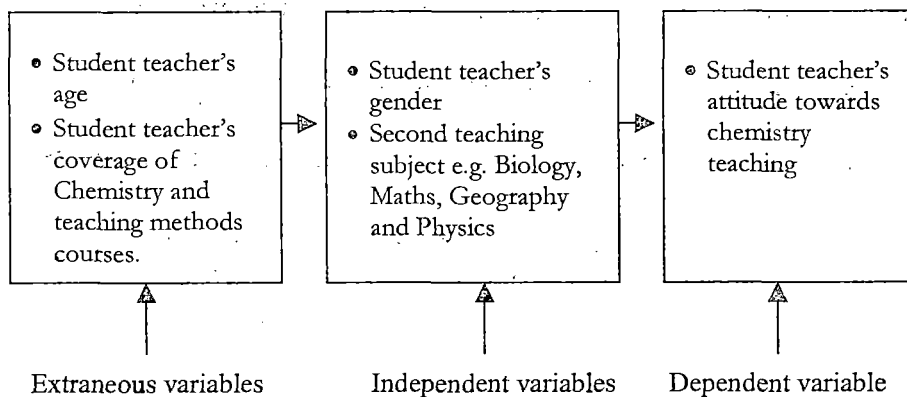
To achieve the objectives of the study, the following hypotheses were tested at 0.05 level of significance.

- H₀₁ Chemistry student teachers do not have a positive attitude towards chemistry teaching.
- H₀₂ There is no statistically significant relationship between student teachers' gender and their attitudes towards chemistry teaching.
- H₀₃ There is no statistically significant relationship between student teachers' subject combinations and their attitudes towards chemistry teaching.

Conceptual Framework

A teacher's attitude towards teaching may be affected by several factors (Sprinthall & Sprinthall, 1990). In this study, the relationships between teachers' gender, their subject combinations and their attitudes towards chemistry teaching were investigated. Other factors such as the teacher's age, coverage of teaching methods courses and chemistry content were controlled by involving student teachers who were of similar age and at the same level of learning. Diagrammatically, the framework may be represented as follows:-

Figure 1: Conceptual Framework for Determining the Relationship between Student Teacher's Gender, Second Teaching Subject and Attitudes towards Chemistry Teaching



Methodology

Research Design

This was a quantitative study in which a survey was conducted on Egerton University students in the 2002/2003 academic year. The third year student teachers were purposefully sampled for the study because they had covered three years of chemistry content. In addition, they had just covered chemistry subject methods course and were about to proceed for teaching practice. Therefore, they were well placed in responding to the items in the questionnaire.

Sample

The sample included all the Bachelor of Education (Science) preservice chemistry students in the 2002/2003 academic year. The students were considered to be sufficiently well prepared to be able to respond to the items in the research instrument. There were 71 male and 34 female student teachers, making a total of 105 respondents.

Instrumentation

A modified questionnaire for measuring chemistry teacher's attitude towards teaching was developed and used for data collection (Mullei, 1987). It had twenty Likert type items in the following areas:-

- a) Interest in teaching chemistry.
- b) Attitudes towards resources used in chemistry teaching.
- c) Attitudes towards training of chemistry teachers.
- d) Attitudes towards chemistry as a career.
- e) Value of chemistry in nation building.

Questionnaire items were reviewed and found to be content valid by a panel of experts drawn from Egerton University as recommended by Borg and Gall (1989). The reliability coefficient of the instrument was 0.71. This is an acceptable value for the study (Fraenkel & Warren, 1990).

Data Collection and Analysis

The sampled students were informed and requested to assemble in the lecture hall on a fixed date and time. The questionnaire was then administered by the researchers. This ensured 100% return of the filled questionnaires. Sanders and Pinhey (1979) group survey procedure was observed.

Descriptive statistics were used to analyse the data. In addition, inferential statistics were used particularly t-test and ANOVA.

Results

Overall Students' Attitudes Towards Chemistry Teaching

Overall mean score on the CTAQ is 85.18%. This is quite high, indicating that the student teachers have positive attitudes towards chemistry teaching. This could be an indicator of the attitudes inculcated in them during the chemistry content and methods courses.

Relationship Between Student Teachers' Gender and their Attitudes Towards Chemistry Teaching

There were 71 male and 34 female student teachers in the study. The average score attained by male student teachers was 85.15%, while that of female student teachers was 85.24%. Although the female student teachers' score was slightly higher than that of male student teachers, the difference was not significant $t(103) = 0.059$, $p > 0.05$.

Table 1: Independent Samples t-test of the Scores by Male and Female Student Teachers on the CTAQ

Students	N	Mean Score %	S.D.	t-value	p-value
Male Student Teachers	71	85.15	6.74	0.059	0.953
Female Student Teachers	34	85.24	5.93		

This implies that male and female student teachers have similar attitudes towards chemistry teaching.

Relationship Between Student Teachers' Subject Combination and their Attitudes Towards Chemistry Teaching

In order to determine whether there is a relationship between teachers' subject combination and their attitudes towards Chemistry teaching, an analysis of their scores in the CTAQ was carried out. H_{03} sought to establish whether there is a relationship between student teachers' subject combination and their attitudes towards Chemistry teaching. Table 2 shows the CTAQ mean scores obtained by students based on subject combinations.

Results in Table 2 show that the physics/chemistry students had the highest mean score, while the maths/chemistry students had the lowest score.

Table 2: CTAQ Mean Scores Obtained by Students

Group	N	Mean Score %	S.D.
Maths/Chemistry	60	84.17	6.99
Biology/Chemistry	26	85.92	5.71
Geography/Chemistry	11	85.00	5.08
Physics/Chemistry	8	90.63	3.11
Total	105	86.43	6.46

Table 3 shows the results of one way ANOVA based on the means in Table 2. It shows that the differences in mean scores are not significant, $F(3, 101) = 2.62$, $p > 0.05$. H_{03} is, therefore, retained.

Table 3: ANOVA of the CTAQ Mean Scores Based on Students' Subject Combinations

	Sum of squares	df	Mean Square	F	p-value
Between groups	313.507	3	104.502	2.622	0.055
Within groups	4026.054	101	39.862		
Total	4339.561	104			

Having established that there was no significant difference between the means, it was then necessary to carry out further tests on the various combinations of means. Table 4 shows the results of the Least Significance Difference (LSD) post hoc comparisons

Table 4: Post Hoc Comparisons of the CTAQ Mean Scores Based on Subject Combinations

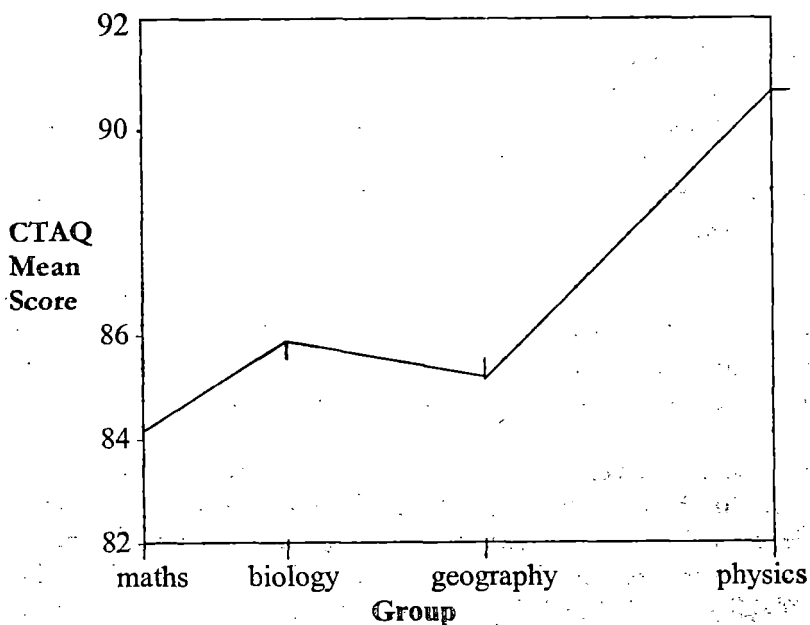
(I) Subject	(J)	Mean Difference (I-J)	p-Value
LSD Maths	Biology	- 1.756	0.239
	Geography	- 0.833	0.688
	Physics	- 6.458	0.008
Biology	Maths	1.756	0.239
	Geography	0.923	0.685
	Physics	- 4.702	0.068
Geography	Maths	0.833	0.688
	Biology	- 0.923	0.685
	Physics	- 5.625	0.058
Physics	Maths	6.458	0.008
	Biology	4.702	0.068
	Geography	5.625	0.058

Results in Table 4 show that the pairs of mean scores of students in various groups are not statistically different except those of Physics and Maths students. For the mathematics and physics students, $p = 0.008$. The CTAQ mean scores of the four groups are in the following order:

$$\bar{X} (\text{Physics}) > \bar{X} (\text{Biology}) > \bar{X} (\text{Geography}) > \bar{X} (\text{Mathematics})$$

This means that Physics students have the highest positive attitude towards chemistry teaching while Mathematics students have the lowest. For the Maths/Chemistry and Physics/Chemistry students, H_{03} is rejected. The four means are represented in the graph shown in Figure 2.

Figure 2: CTAQ Mean Score of the Four Groups



The graph (Figure 2) shows the trend of the mean scores. Physics students have the highest score while Mathematics students have the lowest.

Discussion

Overall mean score of student teachers' attitudes towards Chemistry teaching is 85.18%. This means that most Chemistry student teachers have positive attitudes towards Chemistry teaching.

Mullei (1987) reported that teachers who have favourable attitudes towards Chemistry teaching engage more in activity-centred teaching programmes than those whose attitude is less favourable. Since both male and female teachers have been found to have favourable attitudes towards Chemistry teaching, it would be expected that they are likely to engage in superior teaching methods which involve inquiry and discovery approach (Wachanga, 2002).

Gender has no influence on student teachers attitudes towards Chemistry teaching. However, it was observed that significantly more female teachers than male ones found education courses useful in the preparation of Chemistry teachers $t(103) = 2.796, p < 0.05$. In addition, it was established that significantly more female teachers than male ones felt that they did not need refresher courses $t(103) = 2.003, p < 0.05$. This indicated that female teachers were more confident in handling Chemistry teaching than their male counterparts. This contradicts Mullei's (1987) finding that male teachers hold more favourable attitudes towards science teaching than their female counterparts.

In this study, the findings indicate that female teachers are satisfied with the training they have received and are therefore likely to be motivated in their teaching. This has positive implications for Chemistry teaching in that the female teachers will provide proper role models for girls in secondary schools (Wasanga, 1997).

This study established that the teachers who were being trained to teach Physics and Chemistry had the highest favourable attitude towards chemistry teaching while mathematics and chemistry student teachers had the lowest mean score. It seems that the closer the second subject was related to Chemistry, the higher the mean score. Physics and Biology, being science subjects, resulted in a high favourable teacher's attitude towards chemistry teaching. There is, therefore, need to increase the number of Physics/Chemistry and Biology/Chemistry teachers in the University.

Implications of the Study

The high favourable attitudes towards Chemistry teaching shown by teacher trainees implies that the training approach used in the university should be enhanced. However, the number of female teacher trainees should be increased as the number has always been lower than that of male teachers. This also applies to the number of teacher trainees who take two science subjects such as Physics/Chemistry and Biology/Chemistry.

Conclusion

Based on the results of this study, the following conclusions have been reached:-

- 1) Chemistry student teachers have positive attitudes towards Chemistry teaching.
- 2) Gender has no effect on student teacher's attitude towards Chemistry teaching.
- 3) Subject combination has no effect in student teacher's attitude towards Chemistry teaching except in the case of Physics/Chemistry trainees whose attitudes are significantly more favourable than those of Maths/Chemistry trainees.

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